

**WHAT IS CLAIMED IS:**

1. A method of producing a finish for a selected wood substrate, wherein the finish provides the selected wood substrate with a color that matches the color of a target object, said method comprising the steps of:

    providing a spectrophotometer;

    providing a plurality of different colorants, wherein none of the colorants are a white colorant;

    providing a vehicle for producing semitransparent wood stain;

    providing at least one database containing spectral data for the colorants as applied to at least one type of wood;

    obtaining reflectance measurements of the target object using the spectrophotometer;

    performing calculations to determine the quantities of at least one group of the colorants required to produce a semitransparent wood stain from the vehicle, wherein when the semitransparent wood stain is applied to the selected wood substrate, the selected wood substrate will have a color that matches the target object, and wherein the calculations are performed using the spectral data of the colorants and the reflectance measurements of the target object;

    producing the semitransparent wood stain from the vehicle and the at least one group of colorants;

    staining a portion of the selected wood substrate with the semitransparent wood stain;

    obtaining reflectance measurements of the stained portion of the selected wood substrate using the spectrophotometer; and

    determining whether the color of the stained portion of the selected wood substrate is within a certain color tolerance of the color of the target object, wherein the determination is made using the reflectance measurements of the target object and the reflectance measurements of the stained portion of the selected wood substrate.

2. The method of claim 1, wherein if the color of the stained portion of the selected wood substrate is not within the certain color tolerance, the method comprises the following additional steps:

performing additional calculations to determine quantities of the at least one group of the colorants required to produce a second semitransparent wood stain from the vehicle, wherein when the second semitransparent wood stain is applied to a second portion of the selected wood substrate, the second portion of the selected wood substrate will have a color that matches the target object, and wherein the additional calculations are performed using the spectral data of the colorants, the reflectance measurements of the target object and the reflectance measurements of the stained portion of the selected wood substrate;

producing the second semitransparent wood stain from the vehicle and the at least one group of colorants; and

staining a second portion of the selected wood substrate with the second semitransparent wood stain;

obtaining reflectance measurements of the stained second portion of the selected wood substrate using the spectrophotometer; and

determining whether the color of the stained second portion of the selected wood substrate is within a certain color tolerance of the color of the target object, wherein the determination is made using the reflectance measurements of the target object and the reflectance measurements of the stained second portion of the selected wood substrate.

3. The method of claim 1, wherein the at least one database comprises a plurality of databases containing spectral data for the colorants as applied to different types of wood, each of said databases being dedicated to one type of wood; and wherein the method further comprises the step of:

inspecting the selected wood substrate to determine what type of wood it is; and

selecting the database dedicated to the type of wood that is the same as or closest to the type of wood the selected wood substrate is composed of; and

wherein the calculations are performed using the spectral data of the colorants from the selected database.

4. The method of claim 1, wherein the reflectance measurements of the selected wood substrate are taken at set wavelength intervals along the visible light spectrum, and wherein the reflectance measurements of the target object are taken at set wavelength intervals along the visible light spectrum.

5. The method of claim 4, wherein the reflectance measurements of the stained portion of the selected wood substrate are average reflectance measurements, each of said average reflectance measurements being an average of localized reflectance measurements taken at a plurality of different locations on the stained portion of the selected wood substrate.

6. The method of claim 5, wherein the localized reflectance measurements of the stained portion of the selected wood substrate are made in at least one light wood area and in at least one dark wood area.

7. The method of claim 6, wherein the localized reflectance measurements of the stained portion of the selected wood substrate are made in two light wood areas and in two dark wood areas.

8. The method of claim 4, wherein the target object is a stained piece of wood and wherein the reflectance measurements of the target object are average reflectance measurements, each of said average reflectance measurements being an average of localized reflectance measurements taken at a plurality of different locations on the target object.

9. The method of claim 8, wherein the localized reflectance measurements of the target object are made in at least one light wood area and in at least one dark wood area.

10. The method of claim 9, wherein the localized reflectance measurements of the target object are made in two light wood areas and in two dark wood areas.

11. The method of claim 1, wherein the target object is a stained piece of wood, and wherein the method further comprises the step of inspecting the target object to determine if it has a clear topcoat, and wherein if the target object is determined to have a clear topcoat, the method further comprises the steps of providing a clear topcoat and applying the topcoat to the stained portion of the selected wood substrate before obtaining the reflectance measurements of the stained portion of the selected wood substrate.

12. The method of claim 1, wherein the calculations are performed using a computer.